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Applying Mixed Methods Research at the Synthesis Level: An Overview

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Abstract

Historically, qualitative and quantitative approaches have been applied relatively separately in synthesizing qualitative and quantitative evidence, respectively, in several research domains. However, *mixed methods* approaches are becoming increasingly popular nowadays, and practices of combining qualitative and quantitative research components at the *primary* empirical study level recently have increased significantly in frequency. Nonetheless, this mixing of methods is only seldom considered and adapted at the *synthesis level*. Thus, we presented an overview of the recent developments concerning mixing methods at the synthesis level, and explored the possible contributions and challenges of mixed methods research to the integration of qualitative and quantitative research at this level.

Keywords: mixed methods research; mixed methodology; systematic review; research synthesis

The importance of systematically reviewing research evidence for generating up-to-date condensed records that accurately inform policy and practice has gradually been recognized during the last two centuries (Chalmers, Hedges, & Cooper, 2002; Mays, Pope, & Popay, 2005). Accordingly, in several research domains, various techniques and methods have been elaborated for systematically analyzing and accumulating evidence in research syntheses (Forbes & Griffiths, 2002; Major & Savin-Baden, 2010; Pluye, Gagnon, Griffiths, & Johnson-Lafleur, 2009; Whittemore & Knafl, 2005; Zimmer, 2006). In 1976, Glass introduced the term *meta-analysis* to describe statistical methods for synthesizing quantitative *primary level* research studies (Chalmers et al., 2002). Nowadays, a varied range of statistical models and techniques is applied to conduct meta-analyses of quantitative research evidence (Borenstein, Hedges, Higgins, & Rothstein, 2009; Campbell, 2004; Cooper & Hedges, 1994; Jenson, Clark, Kircher, & Kristjansson, 2007; Mullen & Rosenthal, 1985; Parker, Hagan-Burke, & Vannest, 2007; Rosenthal, 1991; Scruggs & Mastropieri, 1998; Wolf, 1986).

Furthermore, several qualitative meta-synthesis methods that prompt aggregated comprehension from systematically collected qualitative research evidence have been developed and further advanced. Well-known and widely applied examples are *narrative review*, *meta-summary*, *meta-synthesis*, *meta-study*, *grounded formal theory*, *aggregated analysis*, and *meta-ethnography* (Barbour & Barbour, 2003; Campbell et al., 2003; Estabrooks, Field, & Morse, 1994; Finfgeld, 2003; Gelo, Braakmann, & Benetka, 2008; Jensen & Allen, 1996; Paterson, Thorne, Canam, & Jillings, 2001; Petticrew & Roberts, 2006; Rice, 2008; Sandelowski & Barroso, 2007; Sandelowski, Voils, & Barroso, 2006; Thorne, Jensen, Kearney, Noblit, & Sandelowski, 2004; Walsh & Downe, 2006; Zimmer, 2006).

In addition, methods have been explored systematically to combine evidence described in qualitative *and* quantitative primary research studies through qualitative *and* quantitative synthesis techniques within a single research study in order to answer very diverse broad and

complex questions in several research areas and content fields (Alise & Teddlie, 2010; Collins, Onwuegbuzie, & Sutton, 2006; Fidel, 2008; Harden & Thomas, 2005, 2010; Hart, Smith, Swars, & Smith, 2009; Hurmerinta-Peltomaki & Nummela, 2006; Hutchinson & Lovell, 2004; Pluye et al., 2009; Sandelowski et al., 2006; Teddlie & Tashakkori, 2009; Voils, Sandelowski, Barroso, & Hasselblad, 2008). Although the practice of combining qualitative and quantitative methods is not new in evaluation and research, it is only after the introduction of the term *mixed methods research* that it became extremely popular (Creswell, 2003; Greene, 2007; Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2005; Tashakkori & Creswell, 2007; Tashakkori & Teddlie, 2003). However, this popularity holds primarily for mixed methods research at the *primary empirical study level*. When conducting a primary level mixed methods study, a team of researchers collects qualitative and quantitative data directly from a group of research participants (e.g., by means of observations, interviews, questionnaires) and combines the collected qualitative and quantitative data in a single study.

When a team of researchers undertakes a *systematic review* by applying the principles of mixed methods research, they undertake a *synthesis level mixed methods study.* We use the notion *mixed methods research synthesis* to refer to this type of systematic review. The *data* included in a mixed methods research synthesis are findings extracted from various published qualitative, quantitative, and mixed methods primary level articles. Qualitative and quantitative synthesis techniques (e.g., meta-analysis, grounded theory, meta-ethnography, thematic synthesis, critical interpretive synthesis) are used to integrate the various primary level articles within a mixed methods research synthesis. Compared to the popularity of mixed methods research at the primary empirical study level, at the synthesis level, a much smaller number of authors have undertaken a mixed methods research synthesis. However, the integration of qualitative and quantitative methods has promising utility for practice at the

primary empirical study level as well as at the synthesis level (Creswell & Tashakkori, 2007; Dellinger & Leech, 2007; Harden & Thomas, 2005; Pluye et al., 2009; Sandelowski et al., 2006; Voils et al., 2008). In order to fill this void, the aim of the present paper is to present an overview of the recent developments concerning mixed methods research at the synthesis level, and to explore the possibilities and challenges of mixed methods research syntheses.

Method

In order to grasp the available literature on mixing qualitative and quantitative methods at the synthesis level, we conducted a qualitative research synthesis (Major & Savin-Baden, 2010; Zimmer, 2006). The design of the present paper is a rapid review. A rapid review results is a brief report that outlines and compiles the findings of research on a certain topic in order to address a focused research question (Grant & Booth, 2009). A rapid review is a review that makes use of less comprehensive methods than a systematic review due to a limited timeframe (e.g., search a limited number of electronic databases). The main criterion for considering papers for this review was that the papers had to describe a synthesis framework applying the principles of mixed methods research. We did not apply a restriction on the publication date range, or the language of the papers.

A search strategy was developed, including a search of electronic databases, a hand search of two journals, and a search of the reference lists of all the identified relevant articles. First, we systematically searched three relevant electronic databases: *Web of Science*, *PsycINFO*, and *ERIC*. Keyword descriptors for publications on mixed methods research synthesis comprised two groups of search terms: (a) *mixed method* and *multi method*; and (b) *synthesis*, *review*, *meta*, and *aggregated*. Search terms within each group were combined by means of a Boolean *OR*. The two groups of search terms were combined by means of a Boolean *AND*. Second, we conducted a hand search of the tables of content of two key journals with a tradition of providing information on the methodology of mixed methods

research: the *Journal of Mixed Methods Research* and *Quality & Quantity: International Journal of Methodology*. Third, we manually searched the bibliographies of all the identified relevant articles.

After retrieving the papers that met our inclusion criteria, we employed analysis techniques described by Major and Savin-Baden (2010) and Zimmer (2006) in order to summarize and to interpret the existing body of literature on synthesis frameworks that apply the principles of mixed methods research. Following the guidelines of Major and Savin-Baden (2010, pp. 56-71), the data analysis consisted of four stages. First, we situated the retrieved studies, identified study findings, and compared the studies. Second, we located themes across the studies. Third, we synthesized data across the studies. Fourth, we interpreted the data across the studies, and moved on from this interpretation to the reporting of the main findings in the present manuscript.

Mixed Methods Research at the Synthesis level: An Overview

Figure 1 depicts the results of our systematic search for frameworks on mixing qualitative and quantitative methods at the synthesis level. When searching the databases *Web of Science, PsycINFO,* and *ERIC;* the journals *Journal of Mixed Methods Research* and *Quality & Quantity: International Journal of Methodology;* and the reference lists of all the identified relevant articles, we located six elaborated synthesis frameworks applying the principles of mixed methods research (see last column in Figure 1). These frameworks are: *integrative review* (Whittemore & Knafl, 2005), *meta-needs assessment* (Gaber, 2000), *mixed methods synthesis* (Harden & Thomas, 2005), *mixed research synthesis* (Sandelowski et al., 2006), *mixed studies review* (Pluye et al., 2009), and *realist review* (Pawson, Greenhalgh, Harvey, & Walshe, 2005). Tables 1 and 2 present an overview of the retrieved synthesis frameworks applying the principles of mixed methods research. Table 1 includes a definition

of each retrieved framework and describes the relation of each framework to mixed methods research. Table 2 shows the proposed synthesis approach for each framework.

INSERT FIGURE 1 ABOUT HERE

INSERT TABLE 1 ABOUT HERE

INSERT TABLE 2 ABOUT HERE

The mixing of qualitative and quantitative research at the synthesis level differs from the mixing of qualitative and quantitative research at the primary study level concerning three major issues. First of all, the *raw data* studied in a primary level article are most often directly collected from multiple research participants by the researcher himself or herself. A primary level researcher gathers the raw data by, for example, observing or interviewing these participants. Sometimes only one individual is studied (e.g., in single-case experimental and case study research), but most often multiple persons are studied and data from all these participants are collected and analyzed and reported in the final research article. A researcher conducting a primary level mixed methods study can usually freely choose what qualitative and quantitative data he or she collects from the participants in order to answer the posed research question. Accordingly, he can personally decide whether qualitative or quantitative (or both) data are dominant in the mixed methods study (e.g., see Creswell, 2003; Morgan, 1998).

The raw data studied when undertaking a mixed methods research synthesis are the data published in primary research reports included in the synthesis. Because researchers undertaking the synthesis only rely on secondary sources (i.e., the data published in primary

research reports are collected by the authors of these reports, and not by the researcher undertaking this synthesis), they are limited to the study of the data that are reported in those primary research reports. They do not have the opportunity to collect (additional) raw data from the research participants themselves. So, researchers undertaking a mixed methods research synthesis are restricted to study the available primary level articles on the research topic, sometimes reporting on only pieces of the collected qualitative and quantitative raw data material.

A second difference between primary level and synthesis level studies concerns the implementation of the research steps that are included in a research study. When conducting a systematic review, the following steps should be followed: (a) framing the research questions and the purposes of the study at hand, (b) choosing a suitable research design and method in accordance with the posed research questions, (c) writing up the review protocol and accordingly systematically searching the literature for relevant evidence, (d) systematically extracting and evaluating the collected data, (e) analyzing and interpreting the data, and (f) discussing and reporting the research findings in order to communicate them to an audience (Heyvaert, Maes, & Onghena, 2011). A primary level study especially differs from a review concerning two steps. First, the development of a review protocol and the literature search in a review differs substantially from and requires a very different kind of expertise compared to the sampling phase in a primary level study. Second, the data extraction and critical appraisal phase in a review and the data collection phase in a primary level study also require rather distinct and specific research skills.

Third, authors of a primary level study can apprehend greater detail of a particular context that is studied and can stay closer to this context when writing up the study's findings, whereas researchers carrying out a synthesis are forced to offer up parts of the rich contextual

information that is provided in the included primary level reports in order to summarize the collected body of research.

When poring over the retrieved frameworks on mixing qualitative and quantitative methods at the synthesis level (Tables 1 and 2), we noticed two different strands of suggestions for terminology in this domain. On the one hand, there are authors who discuss mixed methods research at the synthesis level when simply integrating qualitative and quantitative (and sometimes also mixed) primary studies. For them, it seems like the applied research approach does not necessarily have to contain qualitative *and* quantitative synthesis techniques in order to describe such a meta-study as a mixed methods study. Frameworks that could inspire mixed methods research syntheses that belong to this group are *integrative review* (Whittemore & Knafl, 2005), *mixed research synthesis* (Sandelowski et al., 2006), *mixed studies review* (Pluye et al., 2009), and *realist review* (Pawson et al., 2005). Because these definitions only apply to the integration of qualitative and quantitative primary studies, and do not include guidelines on the applied research approaches, an exclusive narrative review incorporating qualitative and quantitative primary studies can, for example, be called a *mixed studies review*. These frameworks do not exclude the mixing of qualitative and quantitative synthesis techniques; they simply do not demand a mixed methods research synthesis to combine multiple synthesis techniques. Recently carried out mixed methods review examples integrating results from qualitative as well as quantitative (and sometimes also mixed) primary studies are Bryon, Gastmans, and Dierckx de Casterlé (2008); Javanparast et al. (2010); and Whittemore (2005).

In addition, there exist several techniques for synthesizing data from both qualitative and quantitative primary studies through *quantitizing* (i.e., numerically translating, transforming, or conversing qualitative data into quantitative data; Sandelowski, Voils, & Knaff, 2009) qualitative data and *qualitizing* (i.e., transforming quantitative data into data that

can be analyzed qualitatively; Tashakkori & Teddlie, 1998) quantitative data (Evans & Fitzgerald, 2002; Greenhalgh et al., 2005; Mays et al., 2005; Roberts, Dixon-Woods, Fitzpatrick, Abrams, & Jones, 2002). Because the studies using those quantitizing and qualitizing techniques only apply to quantitative and qualitative methods, respectively, to synthesize the gathered qualitative *and* quantitative data, they, as well, can be placed into this first strand.

On the other hand, there are authors who describe mixed methods research at the synthesis level when integrating qualitative and quantitative primary studies through the application of qualitative and quantitative synthesis techniques. For example, Harden and Thomas (2005) describe a synthesis employing both qualitative and statistical analysis techniques when combining evidence discussed in qualitative and quantitative primary articles as a mixed methods synthesis. Gaber (2000) describes a meta-needs assessment approach as based on meta-analysis and mixed methods research strategies (triangulation). Recently carried out mixed methods review examples integrating data from qualitative and quantitative studies through applying qualitative and quantitative synthesis techniques are Alise and Teddlie (2010); Caffrey, Fuchs, and Fuchs (2008); Thomas et al. (2004); and Voils et al. (2008).

Analogous to a typology of primary mixed methods studies (Onwuegbuzie & Johnson, 2004), we picture these recent suggestions to define and to implement mixed methods research syntheses on a continuum going from *not mixed*, to *partially mixed*, to *fully mixed methods*. Within the originally primary level typology, fully mixed methods designs represent the highest degree of mixing research methods and research paradigm characteristics, because they use both qualitative and quantitative research elements concerning some of the following four components: the research objective; the type of data and operations; the type of analysis; and the type of inference (Leech & Onwuegbuzie, 2009).

Accordingly, at the synthesis level, we could position authors who discuss mixed methods research syntheses when only integrating qualitative and quantitative primary studies at a *partially mixed* position, whereas placing authors applying this term when integrating qualitative and quantitative primary studies through the application of qualitative and quantitative synthesis techniques closer to the *fully mixed* position. *Not mixed* research syntheses apply a mono-method qualitative or quantitative approach (see examples discussed in the introduction).

Mixed Methods Research at the Synthesis level: Possibilities

When reading the retrieved mixed methods research syntheses, we noted several possible advantages concerning the combining of multiple primary level findings and the mixing of diverse synthesis techniques. Many domains of research contain quantitative as well as qualitative research studies. For example, the domain of educational research contains many experimental, quasi-experimental, and correlational studies that are based on numbers and measurements, as well as case studies and action research studies that are grounded on narrative descriptions and observations. Due to the inclusion of qualitative and quantitative primary level findings within a single research synthesis, a larger amount of data concerning one phenomenon of interest can be collected for interpretation, in comparison to a mono-method synthesis relying on only one data type. Additionally, in comparison, a more diverse range of complementary questions on a phenomenon can be studied within a single synthesis. Complex research questions can be approached from different perspectives, resulting in possibly more exhaustive and more refined answers in comparison to mono-method syntheses. For instance, regarding educational intervention research, a mixed methods research synthesis has the potential to answer multiple aspects of the question *what is it about this kind of intervention that works, for whom, in what circumstances, in what respects, and why?* (Pawson et al., 2005).

The mixing of qualitative and quantitative synthesis techniques can additionally offer multiple opportunities: adding confidence in research data when different synthesis methods arrive at the same conclusions, revealing and developing challenging or integrating theories by comparing and combining the inferences that result from the diverse synthesis methods, and providing a clearer and more comprehensive understanding of a problem at hand by mixing synthesis methods with divergent and complementary data analysis techniques (Gelo et al., 2008; Greene, Caracelli, & Graham, 1989; Jick, 1979; Johnson & Onwuegbuzie, 2004; Morgan, 1998; O'Cathain, Murphy, & Nicholl, 2007; Onwuegbuzie & Johnson, 2006; Plano Clark, Creswell, O'Neil Green, & Shope, 2008; Risjord, Dunbar, & Moloney, 2002; Robins et al., 2008; Thurmond, 2001). Compensating existing weaknesses of one approach by the strengths of the other approach is an often enumerated advantage of mixing qualitative and quantitative methods that equally applies to primary level and synthesis studies (Onwuegbuzie & Johnson, 2006).

Most mixed methods research syntheses apply both to qualitative and quantitative methods in order to achieve convergent validity. However, when a mixed methods research synthesis involving divergent data sources leads to conflicting interpretations, the revealed discrepancies can be taken as a starting point to re-interrogate each dataset in a more profound way. Thus, the robustness of the synthesis can be enhanced, and in comparison to a mono-method synthesis, a more multifaceted and thoroughgoing knowledge of the studied phenomenon can be gained (Moffatt, White, Mackintosh, & Howel, 2006).

Mixed Methods Research at the Synthesis level: Pitfalls

Although the mixing of qualitative and quantitative primary level findings and synthesis techniques can hold multiple opportunities, we notice several possible challenges concerning the implementation of a mixed methods research synthesis when scanning the mixed methods literature. In comparison to mono-method syntheses (e.g., a quantitative

meta-analysis), possible disadvantages of conducting a mixed methods research synthesis are the difficulty of dealing with a more voluminous and divergent amount of data (i.e., published qualitative, quantitative, and mixed methods primary level articles on the research topic); accordingly, the increased amount of time needed to conduct the systematic data collection and the data synthesis, and, consequently, the increased expense of conducting mixed methods research (Thurmond, 2001).

Furthermore, Bryman (2007) identified nine possible barriers to integrating qualitative and quantitative research, that apply to mixed methods research at the primary level as well as to mixed methods research at the synthesis level: (a) a mixed methods research team might end up writing up the quantitative and qualitative findings separately, addressing different audiences in different publications; (b) a mixed methods researcher might stress one set of findings because he or she has greater faith in that set of findings; (c) a mixed methods research study might be set up in such a way that makes it difficult for integration to arise; (d) in research teams with quantitative and qualitative specialists where one phase lags behind the other, there might be some pressure to publish the findings that are already available; (e) skill specialisms might hinder the integration of findings when research teams are composed of *purely* quantitative and *purely* qualitative specialists; (f) a research team might feel that one dataset turns out to be more intrinsically intriguing or outstanding than does the other, which can lead to inequalities in the priority and structuring of the write up; (g) publication issues might inhibit integration because of the tendency for some journals to stress either quantitative or qualitative research; (h) there exist few published studies that explicitly apply mixed methods research at the synthesis level, causing a problem of exemplars; and (i) there might exist ontological divides within the research team. Additionally, differences in epistemological stances within the research team might cause conflicts about the research design (O'Cathain, Murphy, & Nicholl, 2008; Thurmond, 2001). Early collaboration and

frequent meetings with all team members, an ongoing willingness to negotiate emerging problems within the team, and the potential assistance of a third party to resolve remaining problems are fundamental for meeting the described challenges (Robins et al., 2008).

A final issue that can influence the accessibility of implementing a mixed methods research synthesis concerns the data analysis: applied within-method triangulation and between- or across-method triangulation can necessitate combining very divergent methods that seem incompatible, or at least difficult to combine to address shared research questions. However, some existing methodological pitfalls generated by the diversity between and within the mixed qualitative and quantitative methods could be unraveled by breakthroughs derived from analytical techniques that support integration (Bazeley, 2006, 2010; Greene, 2006). In addition, reading diverse mixed methods research syntheses describing multiple ways to compare, to contrast, to build on, or to embed one type of conclusion with the other in order to provide a fuller understanding of a phenomenon under study can inspire and activate researchers in diverse research domains to implement a multi-method instead of a mono-method synthesis.

Summary and Conclusion

Concerning mixed methods research, we notice that the possibilities of combining qualitative and quantitative methods at the synthesis level are barely studied and discussed, compared to the sizable amount of literature that has recently been written on mixing methods at the primary study level. Regarding different methods to systematically review research evidence, we likewise notice that combining qualitative and quantitative methods at the synthesis level is only seldom undertaken, and that the vast majority of published reviews apply a mono-method qualitative (e.g., narrative review) or quantitative (e.g., meta-analysis) approach. However, there are many arguments for undertaking a mixed methods research synthesis, above all the prospect of a more complete and nuanced understanding of a

phenomenon under study by mixing multiple primary level findings and diverse synthesis techniques (see section *Mixed Methods Research at the Synthesis level: Possibilities*).

A problem created by the fact that the amount of published mixed methods research syntheses is limited, and that the knowledge base on this methodology is still confined, is the problem of exemplars. As Bryman (2007) concludes, the relative absence of exemplars makes it difficult for researchers to draw upon guidelines and best practice when it comes to combining findings in mixed methods research studies. This turns into vicious circle: (a) there is a limited number of mixed methods research synthesis exemplars; (b) researchers intending to undertake a mixed methods research synthesis lack guidelines and exemplars on this methodology and, therefore, abandon this methodology, or researchers do not undertake a mixed methods research synthesis because they have never heard of this methodology and stick to mono-method synthesis practices; (c) accordingly, the number of new mixed methods research synthesis exemplars remains limited; and so on. In order to fill this void and to break this vicious circle, the present paper intended to map recent developments in the field of mixing qualitative and quantitative methods at the synthesis level, presenting mixed methods research synthesis exemplars and frameworks in a structured manner.

In pursuance of achieving this aim, the present rapid review resulted in a systematic search for synthesis frameworks applying the principles of mixed methods research. Our search strategy included a search of three electronic databases, a hand search of two journals, and an additional search of the reference lists of all the identified relevant articles. We retrieved six synthesis frameworks applying the principles of mixed methods research, and described them in Tables 1 and 2. Additionally, we discussed the main differences between the mixing of qualitative and quantitative research at the primary study level and the mixing of qualitative and quantitative research at the synthesis level. When studying the six retrieved frameworks, we differentiated between two types of suggestions for undertaking a mixed

methods research synthesis: (a) mixed methods research syntheses that simply integrate qualitative and quantitative (and sometimes also mixed) primary studies, without requiring the synthesis to involve qualitative and quantitative synthesis techniques; and (b) mixed methods research syntheses that require the integration of qualitative and quantitative primary studies, as well as the combined use of qualitative and quantitative synthesis techniques. Analogous to a typology of Onwuegbuzie and Johnson (2004), we classified these suggestions to define and to implement mixed methods research syntheses on a continuum going from not mixed, to partially mixed, to fully mixed methods, and provided exemplars for the different types of suggestions. By presenting different (groups of) synthesis frameworks applying the principles of mixed methods research and exemplars, we answer to the call of Bryman (2007), asking for a greater recognition of different approaches to integration in mixed methods investigations, and for greater attention to different generic forms that integration can take and the identification of examples for each category.

Furthermore, we provided an overview of possible advantages of undertaking a mixed methods research synthesis that can convince a researcher considering conducting such a synthesis and that can help him or her maximally to exploit the benefits of such a synthesis for advancing the knowledge base in the research domain. Mixing multiple primary level findings and diverse synthesis techniques can help researchers to increase the completeness, the versatility, the refinement, and the grounding of the resulting inferences. Used in an appropriate way, mixing qualitative and quantitative methods in a single synthesis can be a preferred option to acquire complementary findings and to strengthen research results (Jick, 1979; Thurmond, 2001). Additionally, we listed some possible drawbacks of undertaking a mixed methods research synthesis that should be considered when designing the protocol for a planned mixed methods research synthesis process. When a research topic and question at hand necessitate a thoroughgoing approach through the consulting and application of

qualitative and quantitative data and synthesis techniques, we hope that future researchers are motivated to embark on a mixed methods journey, in which they might experience several of its above stated promises and potentials for educational research.

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Table 1

Overview of Retrieved Synthesis Frameworks Applying the Principles of Mixed Methods Research: Definition and Relation to Mixed Methods Research

Presented framework	**Definition**	**Relation to mixed methods research**
Integrative review	*Integrative reviews are the broadest type of research review methods allowing for the simultaneous inclusion of experimental and non-experimental research in order to more fully understand a phenomenon of concern. Integrative reviews may also combine data from the theoretical as well as empirical literature.* (Whittemore & Knafl, 2005, p. 547)	*Primary research methods of analysis developed for mixed method and qualitative designs are particularly applicable to the integrative review method allowing for iterative comparisons across primary data sources.* (Whittemore & Knafl, 2005, p. 550)
Meta-needs assessment	*Meta-needs assessment is a comprehensive analysis of existing human service needs assessments using secondary data conducted by public, non-profit, and private organizations in a particular community.* (Gaber, 2000, p. 139)	*The meta-needs assessment approach is based on two areas of research: meta-analysis and mixed method research strategies (triangulation). The meta-analysis literature provides the premise and protocol on how to conduct a meta-needs assessment. Mixed method research provides insight on how to compare and analyze multiple data sets in a single research project.* (Gaber, 2000, pp. 140-141)
Mixed methods synthesis	*A mixed methods synthesis is a synthesis that employs both qualitative analysis and statistical analysis.* (Harden & Thomas, 2005, p. 264)	*Our methods involve conducting three types of synthesis: (1) a statistical meta-analysis to pool trials of interventions tackling a particular health, social or educational problem; (2) a synthesis of studies examining people's perspectives or experiences of that problem using qualitative analysis; and (3) a mixed methods synthesis bringing the products of (1) and (2) together.* (Harden & Thomas, 2005, p. 257)
Mixed research synthesis	*Mixed research synthesis is our name for the type of systematic review aimed at the integration of results from both qualitative and quantitative studies in a shared domain of empirical research.* (Sandelowski et al., 2006, p. 29)	*The data in mixed research synthesis studies are the findings of primary qualitative and quantitative studies in a designated body of empirical research. The focus of mixed research synthesis studies is on researchers' integrations of their data, or the results they report; the products of mixed research synthesis studies are other researchers' (i.e., reviewers of research) integrations of those results to "sum up" what is known about a target phenomenon and, thereby, to direct both practice and future research.* (Sandelowski et al., 2006, p. 29)
Mixed studies review	*A mixed studies review is a literature review that concomitantly examines qualitative, quantitative and mixed methods primary studies.* (Pluye et al., 2009, p. 530)	*The authors consider mixed studies reviews to be a form of literature review in which a reviewer or reviewer team concomitantly reviews qualitative and quantitative studies, and/or mixed methods studies, for the broad purpose of breadth and depth of understanding and corroboration of knowledge based on all types of empirical research, and synthesizes qualitative findings and quantitative results of primary studies. The purpose of mixed studies reviews may be exploratory where the qualitative component dominates (qualitative mixed) or confirmatory where the quantitative component dominates (quantitative mixed) or both exploratory and confirmatory where there is some equality of the quantitative and qualitative components (pure mixed).* (Pluye et al., 2009, p. 532)
Realist review	*Realist review is a relatively new strategy for synthesizing research which has an explanatory rather than judgmental focus. It seeks to unpack the mechanism of how complex programs work (or why they fail) in particular contexts and settings.* (Pawson et al., 2005, p. 21) *Realist review is not a method or formula, but a logic of enquiry that is inherently pluralist and flexible, embracing both qualitative and quantitative, formative and summative, prospective and retrospective, and so on.* (Pawson et al., 2005, p. 32)	*The realist approach has no particular preference for either quantitative or qualitative methods. It sees merit in multiple methods, marrying the quantitative and qualitative, so that both the processes and impacts of interventions may be investigated.* (Pawson et al., 2005, p. 22)

Table 2

Overview of Retrieved Synthesis Frameworks Applying the Principles of Mixed Methods Research: Proposed Synthesis Approach

Presented framework	**Proposed synthesis approach**
Integrative review (Whittemore & Knafl, 2005)	Describes successive stages: 1. Problem identification stage 2. Literature search stage 3. Data evaluation stage 4. Data analysis stage - Data reduction - Data comparison - Conclusion drawing - Verification 5. Presentation stage
Meta-needs assessment (Gaber, 2000, pp. 141-142)	Describes successive stages: 1. Problem formulation 2. Gather relevant documents 3. Evaluation of collected data - Content analysis 4. Analysis of collected data - Comparing and contrasting - Statistical techniques - Narrative procedure - Vote counting
Mixed methods synthesis (Harden & Thomas, 2005, pp. 262-264)	Describes successive stages: 1. Consultation, scoping, mapping 2. Focused review question 3. Quantitative synthesis of trials 4. Qualitative synthesis of view studies 5. Mixed methods synthesis of all studies (trials and view studies) employing both qualitative and statistical analysis
Mixed research synthesis (Sandelowski et al., 2006, pp. 34-37)	Describes different designs for mixed research synthesis studies: - Segregated design (first qualitative synthesis of one group of findings and quantitative synthesis of another group of findings; afterwards mixed research synthesis synthesizing the two separate synthesis products) - Integrated design (retrieval of empirical qualitative, quantitative, or primary mixed methods studies, followed by a single mixed methods analysis of findings, with an analytic emphasis on transforming findings to be combined, e.g. by qualitizing all data) - Contingent design (the results of synthesizing the findings in one group of studies to answer one research question determine the second group of studies, that will be retrieved and analyzed to answer a second research question, the results of which may lead to the analysis of a third group of studies retrieved to answer yet another research question, and so on)
Mixed studies review (Pluye et al., 2009, p. 532)	Describes ways for integrating data in mixed studies reviews: - The production of mixed studies reviews involves moving back and forth between the different types of evidence in an iterative process: the production of mixed evidence can be conceived as loops between qualitative evidence and quantitative evidence - Three types of stances refer to the integration of qualitative and quantitative data or results: assimilation, complementarity, and divergence (see also Teddlie and Tashakkori, 2003).
Realist review (Pawson et al., 2005, p. 24)	Describes successive stages: 1. Clarify scope 2. Search for evidence 3. Appraise primary studies and extract data 4. Synthesize evidence and draw conclusions (e.g., use contradictory evidence to generate insights about the influence of context; present conclusions as a series of contextualized decision points of the general format 'If A, then B' or 'In the case of C, D is unlikely to work') 5. Disseminate, implement and evaluate

Search of three electronic databases:

Search term / Data-base	Mixed method AND synthesis	Multi method AND synthesis	Mixed method AND review	Multi method AND review	Mixed method AND meta	Multi method AND meta	Mixed method AND aggregated	Multi method AND aggregated	**Retrieved mixed methods review frameworks**
Web of Science	21	10	53	59	5	7	1	4	**A, B**
PsycINFO	3591	3582	3141	4539	7684	7635	3141	4539	**C, D, E, F**
ERIC	10	5	80	23	15	1	1	0	/

Hand search of *Journal of Mixed Methods Research* and *Quality & Quantity* /

Search of the reference lists of all the identified relevant articles /

Retrieved mixed methods review frameworks: A = 'mixed studies review' (Pluye et al., 2009); B = 'meta-needs assessment' (Gaber, 2000); C = 'integrative review' (Whittemore & Knafl, 2005); D = 'mixed research synthesis' (Sandelowski et al., 2006); E = 'mixed methods synthesis' (Harden & Thomas, 2005); F = 'realist review' (Pawson et al., 2005)

Figure 1: Retrieved synthesis frameworks applying the principles of mixed methods research.